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Published in:
Antennas and Propagation Society International Symposium

Publication date:
1967

Document Version
Publisher's PDF, also known as Version of record

EXCITATION OF CREEPING WAVES BY MODE CONVERSION OF A CRITICALLY INCIDENT RAY+

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A curved interface between two different dielectric media or a curved rigid metallic surface surrounded by a compressible isotropic plasma are considered. When a ray which propagates with the larger of the two propagation constants involved in these problems strikes the boundary under the critical angle of incidence a converted creeping wave is excited.

This diffraction process is studied by means of the asymptotic representation of the exact solution to the simple problem of a line source and a circular cylinder. The field expression cannot immediately be interpreted in terms of the Geometrical Theory of Diffraction. To obtain an interpretation two hypotheses are proposed. The creeping wave is assumed to initiate at the point of tangency between the critically transmitted or reflected converted ray and the caustic for the family of transmitted or reflected converted rays. This caustic point lies close to the point of incidence. Furthermore, the amplitude on the incoming ray is assumed to be related to the amplitude on the transmitted or reflected converted rays in such a manner that the surface fields produced by these two ray modes are of equal magnitude at the border of the lit region. The description of the birth of the creeping wave then becomes exactly the same as in the simple case where no mode conversion is involved in the diffraction process.

Finally we discuss the bearing of these points of view for the situations in the Geometrical Theory of Surface Diffraction where only one mode of propagation is present.

+Part of the present work was carried out while the author was a Research Associate at the University of Michigan Radiation Laboratory.